MYAT-204

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	:	Donald Aves
Serial No.	:	09/320,303
Filed	:	5/26/99
For	:	METHOD FOR SELECTING OPTIMIZED LENGTHS OF A SEGMENTED TRANSMISSION LINE AND A TRANSMISSION LINE RESULTING THEREFROM
Art Unit	:	2123
Examiner	:	Hugh M. Jones

December 23, 2002

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Sir:

TRANSMITTAL LETTER

Transmitted herewith in triplicate is a Brief on Appeal for this application. Also enclosed is a check in the amount of $160 for the PTO fee.

The PTO fee is calculated as follows:

[ ] $320 for other than small entity.

[x] $160 for small entity.

CONDITIONAL PETITION FOR EXTENSION OF TIME

If any extension of time for this Appeal Brief is required, applicant requests that this be considered a petition therefor.

Please charge the required Petition fee to Deposit Account No. 50-0427.

Respectfully submitted,

By________________________
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I hereby certify that this correspondence is being deposited with the United States Postal Services as first class mail in an envelope addressed to: Commissioner of Patents & Trademarks, Washington, DC 20231 on

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MILDE & HOFFBERG, LLP

By STEVEN M HOFFBERG

Date 12/23/02

AP/2123 #

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#14

Applicants	:	Donald Aves
Serial No.	:	09/320,303
Filed	:	5/26/99
For	:	METHOD FOR SELECTING OPTIMIZED LENGTHS OF A SEGMENTED TRANSMISSION LINE AND A TRANSMISSION LINE RESULTING THEREFROM
Group Art Unit	:	2123
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APPLICANTS' APPEAL BRIEF UNDER 37 C.F.R. §1.192

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

SIR:

In response to the Office Action dated May 21, 2002, a timely Notice of Appeal having been filed October 23, 2002, Applicant herewith provides its Appeal Brief.

(1) REAL PARTY IN INTEREST

Application is assigned to Myat, Inc., a New Jersey corporation, the real party in interest.

(2) RELATED APPEALS AND INTERFERENCES

None.

(3) STATUS OF CLAIMS

Claims 1-25 are in the application.

Claims 1-25 are rejected under 35 U.C.S. § 112, first paragraph, as failing to be supported by an enabling specification.

Claims 1-25 are rejected under 35 U.S.C. § 112, second paragraph, as being incomplete for omitting essential steps or elements.

Claims 8-9, 17-20 and 22-25 are rejected under § 35 U.S.C. 112, second paragraph, as allegedly being indefinite.

Claims 10-11 and 13-21 are rejected under 35 U.S.C. § 102(b) as being anticipated by Fleming-Dahl US 5,218,326.

Claims 1-9, 12 and 22-25 are rejected under 35 U.S.C. § 103(a) as being obvious over the '326 patent in view of Huss (IEEE article).

The rejection of claims 1-25 is appealed.

(4) STATUS OF AMENDMENTS

Amendments dated August 16, 2002, will be entered on filing of appeal, per Advisory Action dated September 25, 2002.

(5) SUMMARY OF INVENTION

The present invention relates to the field of segmented transmission lines, and more particularly to the field of high power air-spaced coaxial transmission lines for transmitting a radio frequency modulated broadcast signal to an antenna mast.

Such transmission lines are intended to carry high power signals over relatively long distances. They are segmented in order to facilitate fabrication and maintenance. However, due to the interface between segments, the radio frequency signal is presented with a series of discontinuities. If all of the segments were made the same length, there would be a cumulative, superposition effect of the regularly spaced discontinuities and a resulting in a sharp resonance. A "random" length spacing, either uniformly distributed through a range or with some peak at a nominal value, while likely better than a uniform spacing, may produce undesired resonances within a band of interest, and thus will likely not be optimal.

The art therefore suggested a mathematical algorithm-defined distribution, with a "test" to ensure that effects to not materially interfere within a band of interest. This mathematical model, such as suggested by Fleming-Dahl, seeks to improve over a uniform or random spacing by using a prime-number increment spacing, but does not rigorously model the transmission line to ensure optimality, and does not evaluate order effects of the segments.

In contrast, the present invention defines a model of the system, and spaces the segments to minimize the signal perturbations though the transmission line based on the optimization parameters, which include both order and length. Thus, no simple formula is applied to define the segment lengths. In practice, the resulting distribution of segment lengths typically has a substantially non-linearly increment between segments, with no simple mathematical relationship apparent.

Computer Linear circuit simulation or network analysis is the analytical solution for the response of electrical components to an applied stimulus. Transformations of circuit parameters according to Laplace, Thevenin and Norton, allow the generation of transfer functions to create a system of equations. Unknowns are derived by Matrix methods to solve the equations then manipulated to produce s-parameters that completely describe the response of the network ports. The vector calculus employed by the model references stepped impedance, attenuation, dielectric constant, and capacitive discontinuity at each segmental connector, as well as the desired bandwidth, individual line length, and total run length. The available engineering analysis programs relieve the engineer from the solution and presentation or graphics phase, and allows for full concentration on the problem. A library of components, that includes assemblies of components like transmission line sections, is provided to characterize and assemble into a model. When a component is not in the library, s-parameters of an actual physical component can be incorporated into the model as a ported "Black Box". Parameters of an elbow, filter or antenna can be added to analyze a complete system. Since the evaluation is model-based, the interaction of elements other than the transmission line segments may be evaluated, to ensure that the system as a whole is analyzed, rather than a subsystem thereof.

Thus, in contrast to prior techniques, the solution to the optimization of line segment lengths requires significant calculation, and cannot be simply scaled from a table or otherwise precalculated. Likewise, since the system provides a model-based optimization, constraints may be placed on components, for example allowing a single optimization for a series of segmented transmission lines separated by other components, such as elbows. Prior techniques did not generally accommodate external constraints on individual components, while producing an optimal system.

(6) ISSUES

1. Whether the supplemental information provided with paper 5 is properly excluded from consideration.

2. Whether Fig. 13 must be labeled as "Prior Art".

3. Whether claims 1-25 are properly rejected under 35 U.C.S. § 112, first paragraph, as failing to be supported by an enabling specification.

4. Whether claims 1-25 are properly rejected under 35 U.S.C. § 112, second paragraph.

5. Whether claims 10-11 and 13-21 are properly rejected under 35 U.S.C. § 102(b) as being anticipated by Fleming-Dahl US 5,218,326.

6. Whether claims 1-9, 12 and 22-25 are properly rejected under 35 U.S.C. § 103(a) as being obvious over the '326 patent in view of Huss (IEEE article).

(7) GROUPING OF CLAIMS

The rejected claims of the application do <u>not</u> stand or fall together. Applicants propose that each claim be examined on its own merits.

37 C.F.R. § 1.192(c)(7) requires a statement as to why the claims of the group do not stand or fall together. The below groupings are therefore predicated on a finding by the Board that (a) the references may be properly combined, (b) the combination of references establishes a prima facie rejection of the claims as being obvious, and (c) that the distinctions set forth above between the applied references and the present invention fail to distinguish a respective base claim, rendering it anticipated under 35 U.S.C. §102 or obvious under 35 U.S.C. §103.

Independent claims 1, 10, 22, do not stand or fall together because they have material differences in scope. Claim 1 provides a computer model, while claim 10 provides a method for optimizing and claim 22 provides a computer system. Claim 1 provides an algorithm, while claim 10 simply models the electrical performance, and claim 22 provides a processor for iteratively adjusting. Claims 1 and 22 provide a transfer function, while claim 10 does not. Therefore, these claims are materially different and must be analyzed separately.

Claims 2, 11 and 23, from respectively different parent claims, provide that the set of segment characteristics comprises a respective length of each segment.

Claims 3 and 12, from respectively different parent claims, provide that the model is evaluated to determine a transfer function of the segmented transmission line.

Claim 4 provides that the adjusting means allows adjustment of all characteristic values.

Claims 5 and 13, from respectively different parent claims, provide that segmented transmission line comprises an air-spaced coaxial transmission.

Claims 6 and 14, from respectively different parent claims, provide that the precision of the algorithm or evaluation exceeds a manufacturing tolerance of the segmented transmission line.

Claims 7 and 15, from respectively different parent claims, provide a further means or the step of outputting, a predicted performance of the segmented transmission line based on the respective characteristic values.

Claims 8 and 17, from respectively different parent claims, provide that the respective characteristic values are non-incrementally distributed across a range.

Claims 9 and 18, from respectively different parent claims, provide that the respective characteristic values are non-monotonically distributed across a range.

Claim 16 provides the step of producing a set of transmission line segments according to the selected segment characteristics.

Claim 19 provides that the segment characteristic comprises a respective segment length and the optimization criteria comprises a minimization of worst case VSWR over a radio frequency band.

Claim 20 provides that the segmented transmission line comprises an air-spaced coaxial transmission line adapted for transmitting an RF signal; the segment characteristic comprises a respective segment length; and the optimization criteria comprises a minimization of worst case VSWR over a radio frequency band.

Claim 21 provides that the set of segment characteristics is in an optimal order.

Claim 24 provides that the performance constraint is selected from the group consisting of a signal transmission efficiency and a VSWR.

Claim 25 provides that the segmented transmission line comprises an air-spaced coaxial transmission line adapted for transmitting an RF signal, the characteristic value being a length of a respective transmission line segment, the optimized respective characteristic values being non-incrementally and non-monotonically distributed across a range.

Each claim therefore is distinct and has separate basis for patentability.

(8) ARGUMENT

INFORMATION DISCLOSURE

The attachment to paper number 5 was not intended as an "information disclosure" to the extent that such is admitted prior art. Rather, this was submitted as demonstrating to the Examiner the status obtained in the art with respect to the analysis and modeling of transmission lines, and the fact that "air spaced transmission line" is a phrase used in a technical dictionary as a part of a *definition*, as well as other uses of the phrase in common parlance. Therefore, since these submissions are not admitted prior art, nor necessarily material information to be listed on the face of the issued patent, but rather supplemental information relating to the proper standard for examination, request for waiver of compliance with MPEP § 609 is expressly requested, and full consideration of the submitted materials solicited.

DRAWINGS

Fig. 13 is objected to as failing to include the legend "Prior Art". Applicant respectfully submits, however, that to the extent that this Figure shows segment lengths optimized according to the present invention, it is not prior art.

ENABLEMENT, 35 U.S.C. § 112, FIRST PARAGRAPH

Claims 1-25 are rejected under 35 U.C.S. § 112, first paragraph, as failing to be supported by an enabling specification.

Claims 1-25 are rejected for failing to provide any substantive detail, other than mere reference, to a model, characteristic values, transfer functions, algorithms, distributions, and means for optimization. The Examiner also states that the claim element "air-spaced transmission line" is not adequately disclosed.

Transmission lines, and their characteristics, are well known to those skilled in the art. The analysis of transmission lines is the subject of basic physics (electricity and magnetism) academic courses, and the professional and academic literature is rich with discussions of analytical techniques and models for such systems, as is evidenced by the Examiner's own citation of such as reference against the present application.

In fact, the following query of the USPTO's own database yields

Advanced search; "transmission line" and "model" and application date <5/26/1999, all years, yields 3749 hits:

http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2Fsearch-adv.htm&r=0&p=1&f=S&l=50&Query=%22transmission+line%22+and+model+and+apd%2F19700101-%3E19990526&d=pall

Clearly, such density of the art indicates a level of skill sufficient to enable one of ordinary skill to understand transmission lines and their modeling. The Examiner thus makes an incredible argument that one of ordinary skill in the pertinent art would not understand such basic and well developed aspects of the field.

US 5,436,846 relates to a point discontinuity model for predicting the performance of a microwave system. This aspect of the reference is particularly discussed in the specification of the present application. This patent particularly discloses the mathematics involved in a performance analysis of a microwave transmission system. There are likewise commercial products which will analyze a transmission system, once its characteristics are described.

The level of skill in the art of transmission line analysis and optimization includes, as a minimum, a knowledge of what a transmission line is (including the requirement for a dielectric) and certainly based on a review of the present disclosure, that the various discontinuities result in performance degradation. The person of ordinary skill does not require a definition of terms and phrases commonly used in the art. Such terms and phrases include VSWR, transfer function, and the like. While the person of ordinary skill in the art likely cannot calculate VSWR of a complex system in his head, he does not need to. Automated systems are commercially available, as indicated in the specification, and such a person would know where and how to obtain such a system, if required. The prior art also clearly teaches one of ordinary skill in the art the relevant parameters of an electrical performance model of a transmission line, and further which aspects of the electrical performance are most pertinent to an analysis. Applicant has not claimed to have invented the long-known "transmission line"; rather, a method for optimizing the segment lengths, and presumably, a transmission line have such optimized lengths.

Likewise, the concept of an air-spaced transmission line is either self-explanatory, or needs no explanation to one of ordinary skill in the art. It is well known that a transmission line has two conductive paths, with a dielectric separation. The separation is synonymous with a space. This, an air-spaced transmission line is one in which the principal dielectric is air. The

search of issued patents including "air spaced" and "transmission line" prior to the filing date of the present application yields 294 patents.

http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2Fsearch-adv.htm&r=0&p=1&f=S&l=50&Query=%22air+dielectric%22+and+%22transmission+line%22+and+apd%2F19700101-%3E19990526&d=pall

One type of air-spaced transmission line is an air-spaced coaxial cable. This is also well known and cited in the art. http://www.google.com/search?num=100&hl=en&lr=&ie=ISO-8859-1&q=air+spaced+coaxial+cable yields about 9080 hits, the first of which defines the phrase as:

air-spaced coaxial cable

> **air-spaced coaxial cable:** A coaxial cable in which air is the primary dielectric (insulator) between the inner and outer conductors. *Note:* Proper separation between the inner and outer conductors is maintained by a continuous helical insulator or a series of insulating washers spaced at regular intervals.

> This HTML version of Telecom Glossary 2K was last generated on Wed Feb 28 15:39:21 MST 2001. References can be found in the Foreword.
> http://www.atis.org/tg2k/_air-spaced_coaxial_cable.html

In order to support such non-enablement rejections, the level of skill in the art must be specifically defined, supported by evidence, and such level of skill must be such that the alleged deficiencies of the disclosure are not within the grasp of that person, in light of the specification and pertinent prior art. Mere allegation of non-enablement without proof must be rejected. Applicant respectfully submits that this burden is not met.

MPEP 608.01(p) addresses the issues of completeness of the specification, and expressly permits incorporation of essential and non-essential information through incorporation by reference. While a broad incorporation by reference may be insufficient to demonstrate that the applicant possessed the invention, where the relevance of the reference is discussed in the specification, and that relevance relates to the issue of possession, the Examiner is not free to ignore the incorporated references. Likewise, enablement is to be determined by one of ordinary skill in the art at the time of the invention in view of the specification, which, in this case, cites particular art which should be reviewed. Clearly, when a cited or incorporated reference to the same basic problem as the present invention, that of selecting segment length for (air dielectric)

coaxial transmission lines to minimize VSWR, and indeed presents this in the patent application as the problem to be solved, this clearly indicates that the applicant was indeed in possession of the knowledge imparted by that reference, and further that the specification incorporating such information is enabling for such an air dielectric coaxial cable (air spaced transmission line).

US 5,455,548 is "expressly incorporated herein". The referencing section of the specification makes it clear that this reference is principally distinguished by the use of a "progressive distribution" of line lengths, as opposed to the optimized distribution according to the present invention. A review of Fig. 2 will reveal that, in accordance with PTO policies, the space between the center conductor and outer shell is transparent, indicating air or vacuum. Since no vacuum seals are disclosed, one would interpret this as air. Thus, this reference supports the "air-spaced transmission line" element of the claims. Likewise, US 4,831,346 ("expressly incorporated herein by reference") discloses "air dielectric coaxial cables", which represent the same technical construction as the present "air-spaced transmission line", and would have been recognized by one of ordinary skill in the art at the time of the invention to relate to the same concept.

It is clear that applicant had possession of the invention, since the application reports results for the use thereof. The rejection of an application based on written description is generally limited to cases where a "prophetic disclosure" of the invention is provided, or where the claims encompass subject matter which realistically was not contemplated by the inventor at the time of the filing. The examiner alleges that the later is the case. Rather, applicant respectfully submits that it is entitled to a scope of protection which reasonably protects the invention from misappropriation. The Supreme Court in the recent Festo case, in fact, endorses the ability of applicants to claim subject matter broader than the scope of the specific examples in the patent; this is apparently preferred over later arguments that the Doctrine of Equivalents broadens the claims. Reviewing the application and claims, will reveal that the inventor was indeed in possession of the invention at the time of the application, and that this is clearly conveyed in the specification, as required by law.

The Examiner apparently argues that claim 1 includes "means for" language which references incorporated subject matter. This is not the case. The subject matter of claim 1 is clearly described within the application. No reference to extrinsic resources are required to understand the claim scope.

The Examiner has requested a copy of "computer code". It is respectfully submitted that this request is improper. This code need not be disclosed within the patent application nor file wrapper. There is no "incredible utility" issue herein, such that the Examiner is forced to examine evidence of operativeness, or otherwise question the veracity of the applicant.

The present invention builds upon prior art understanding of transmission lines by providing method of optimization, a computer model and computer system. These are, indeed, disclosed in the specification in such manner as to enable one of ordinary skill in the art to make, use and sell the invention.

For example, the specification states as follows:

> Computer Linear circuit simulation or network analysis is the analytical solution for the response of electrical components to an applied stimulus. Transformations of circuit parameters according to Laplace, Thevenin and Norton, allow the generation of transfer functions to create a system of equations. Unknowns are derived by Matrix methods to solve the equations then manipulated to produce s-parameters that completely describe the response of the network ports.
>
> The available engineering analysis programs relieve the Engineer from the solution and presentation or graphics phase, and allows for full concentration on the problem. A library of components, that includes assemblies of components like transmission line sections, is provided to characterize and assemble into a model. When a component is not in the library, s-parameters of an actual physical component can be incorporated into the model as a ported Black Box. Parameters of an elbow, filter or antenna can be added to analyze a complete system. A full understanding of the assembly is required to interpret the parameters and results.
>
> The method according to the present invention, therefore makes no incremental spacing presumption. An optimized set of line lengths is calculated based on a model of the system, with an optimization parameter addressing the electrical characteristics of the resulting system. This simulation does not depend on any particular increment of line lengths, and indeed the starting condition of the model simulation may be equal line lengths. The vector calculus employed by the model references stepped impedance, attenuation, dielectric constant, and capacitive discontinuity at each segmental connector, as well as the desired bandwidth, individual line length, and total run length.
>
> For example, it may be desired to build a transmission line with 20 sections, have minimum VSWR contribution from flange connections and operate over the UHF TV band. From the prior art, it is known that lengths spread over a 6 inch range will reduce flange discontinuities. Accordingly initial lengths will range from 240 to 234 inches. Connections are made by combining nodes, consecutively assigned to each component. Input and Output Ports are connected by node numbers assigned to the first and last transmission line model components. Each transmission line segment is similar in performance, other than variations resulting from differences in length. The length,

dielectric constant, impedance, attenuation, velocity factor and connector discontinuity are each included in the matrix solution.

The analysis of the present model-based solution uses, for example, 1000 or more frequency points, in order to include the narrow VSWR spikes over the band of interest. Of course, a different number of frequency points may be employed. A Pentium II-based workstation running Microsoft Windows NT 4.0, having a clock rate of at least 400 MHz, is preferred, as each component is adjusted approximately 10 times. Using this computing hardware configuration, spending eight hours to optimize an eighty segment transmission line system is not unusual.

The input to the computer program is changed to increase and decrease each transmission line segment length, testing its sensitivity to reduce VSWR peaks. Every test, i.e., set of segment lengths, requires a new analysis, i.e., calculation of the entire matrix. The length of each segment is incrementally altered until peaks can not be reduced without levels rising in another area. At the beginning of the process, a 1% change increment in line length is used. Subsequently, the change increments are reduced to 0.1%, and then to 0.01%. Clearly, the choice of decade differences in optimization phases is a matter of engineering choice, and other increments and optimization phase change ratios may be employed as desired. Each transmission line segment is revisited many times during each phase of the analysis. The final, optimized lengths are quite different from those putative values present early in the analysis. The limit to reduction of the peaks is similar reaching to the RMS value of the trace.

Thus, it is clear that the process of optimization (e.g., successive approximation based with successively smaller steps) is clearly described: The length parameters of the segmented transmission line are provided with a default starting condition, and sequentially tested and altered in order to obtain an optimum set which meets or best meets the stated performance criteria.

It is thus respectfully submitted that the Examiner has failed to present a prima facie case for invalidity of the claims under 35 U.S.C. § 112, first paragraph, and the rejections should be reversed.

INDEFINITENESS 35 U.S.C. § 112, SECOND PARAGRAPH

The Examiner has indicated that Applicant's proposed Amendment After Final Rejection overcomes the rejection of Claims 8-9, 17-20 and 22-25 under 35 U.S.C. 112, second paragraph, as allegedly being indefinite with respect to "substantially" and "may be defined". (See Advisory Action dated 9/25/2002).

Claims 1-25 are rejected under 35 U.S.C. § 112, second paragraph, as being incomplete for omitting essential steps or elements. The Examiner states that the applicant has not claimed details of the method or apparatus which are necessary for carrying out the optimization.

Applicant respectfully disagrees. The optimization according to the present invention is broadly claimed because applicants are entitled to such claim scope, without regard to the implementation details of the optimization algorithm. The prior art techniques make presumptions as to what will be acceptable to meet the performance criteria. The present invention, on the other hand, searches (including an analysis of the suboptimal conditions) until an optimum condition is found (one that meets the performance criteria). This supports a claim scope using the word "optimizing", and no further eloquence need be provided.

It should be noted that such optimization is typically performed in a general purpose computer system. Therefore, the distinctions comprising the present invention may only be described with respect to abstract mathematical manipulations and functional statements. However, such constructs have been repeatedly deemed patentable by the Federal Circuit Court of Appeals and U.S. Supreme Court.

Reversal of the rejection of the claims as being indefinite is respectfully solicited.

ANTICIPATION REJECTION 35 U.S.C. § 102

Claims 10-11 and 13-21 are rejected under 35 U.S.C. § 102(b) as being anticipated by Fleming-Dahl US 5,218,326 (hereinafter "the '326 patent").

The '326 patent relates to a mathematical method for defining a set of coaxial cable lengths, in no particular order, which operates in the abstract on pure numbers representing lengths to achieve a desired set of relative lengths. At no time during the selection of the cable lengths according to the '326 patent is the performance of the segmented transmission line modeled, nor is the model evaluated. See, Appendix C, Fig. 1 of the '326 patent.

The Examiner has therefore failed to set forth a prima facie case of anticipation, since such are variously required by the claims of the present application.

Therefore, the reference fails to anticipate the present claims. Because the order is not defined, a critical aspect of an optimum system cannot be established, that of order sensitivity. Order matters, because each discontinuity at a segment boundary results in a power reflection;

the successive power reflections interact, and can create both constructive and destructive interference over a range of multiple segments. See, Appendix B, Fig. 1 of the present invention. Thus, by simply selecting the lengths of the segments, and not their respective order, undesired interactions may occur, and advantageous interactions cannot be promoted.

The results of the use of the method according to the present invention thus differ from those of the '326 patent, and there is no reason to conclude that any arbitrary optimization procedure would produce a similar result to that of the '326 patent, indicating that this procedure is not "optimum". Please note that the background of the invention section of the '326 patent states: "Impedance matching techniques are especially impractical in systems, …." In fact, the '326 patent rejects electrical analysis methods, in favor of a mathematical formula which is not based on an optimization.

Reversal of the anticipation rejection is respectfully requested.

OBVIOUSNESS REJECTION 35 U.S.C. § 103

Claims 1-9, 12 and 22-25 are rejected under 35 U.S.C. § 103(a) as being obvious over the '326 patent in view of Huss.

The Examiner admits that Fleming Dahl fail to disclose a transfer function (i.e., a performance assessment parameter), for which Huss is cited as supplying the missing teaching. Applicant agrees that Huss teaches a transfer function of a transmission line. However, perhaps the title is instructive as to the scope: "A mathematical and lumped-element model for multiple cascaded lossy transmission lines with arbitrary impedances and discontinuities". A understood by applicant, Huss does not teach or suggest that the model be used for optimizing the transmission line, but rather for using a simplified expression to represent it. Lumping parameters, in fact, generally ignores or eliminates higher order effects, in order to achieve fewer degrees of freedom and mathematical simplicity. In fact, Huss states clearly that "the pole zero model will ***approximate*** the attenuation and the non-linear phase characteristics of the transmission line". (Emphasis added). This approximation, in fact, will likely remove from consideration the significant higher order factors for each segment, as well as effects which

result from interaction of segments, and thus undermine the optimization according to the present invention. Note that the analysis of Huss is not segment-order dependent.

Thus, by combining the '326 patent with Huss, one is lead to simplify the analysis of the transmission line segment as a lumped-element model, the segments of which may then be sized according to the method of the '326 patent. This combination thus does not teach or suggest the present invention.

Applicant thus submits that the disclosure of a transfer function is not the only substantial critical missing teaching of the '326 patent. Thus, the Examiner has failed to present a prima facie case of obviousness.

As stated above, the '326 patent fails to teach or suggest an optimization. Rather, the '326 patent posits that a prime-number based distribution will yield an acceptable result, without demonstrating optimality or an attempt to determine whether a variation of segment lengths might provide an improved result.

The '326 patent thus discloses that a mathematical sequence may be used <u>instead</u> of a performance analysis, to yield a useful result. Apparently, this is the case: the results according to the '326 patent apparently can meet the stated performance criteria therein. On the other hand, there is no optimization, and the result is suboptimal; that is, if the performance criteria had been further constricted, at some point the method of the '326 patent would fail, while the method according to the present invention would succeed.

As noted in paragraph 27 of the Office Action, "transfer functions are inherent in the analysis and characterization of transmission lines. However, Fleming-Dahl does not explicitly teach transfer functions." This is because the '326 patent <u>does not analyze or characterize the transmission line</u>, and thus merely citing a reference which teaches transfer functions does not remedy this more fundamental deficiency.

The rejection does not answer fundamental questions, such as how the transfer function of Huss is applied to the order of component lengths defined by the '326 patent? If one were to model the transfer function of a single segment of the transmission line or multiple segments of the line, how is this model used to influence the selection of the set of characteristic values?

The scheme according to the '326 patent fails to determine an effect of segment sequence, as required by claims 1 and 22, and indeed provides no motivation with respect thereto. In contrast, according to the present invention, the sequence of lengths is a factor in the optimization.

The cited prior art fails to teach or suggest the application of a complex aggregation of transfer functions of transmission line segments to formulate a model of the complete system, and then employ an optimization algorithm to adjust a "set of characteristic values" to achieve a desired system response.

While the Examiner might argue that "optimization" of a physical system is always obvious, this is simply not the case, especially where computational complexity is an issue, and, in many cases, a suboptimal system is acceptable. For systems with only a few line segments, the issues may be readily solved using trial and error, intuition, or other known techniques, and for complex systems having many line segments, the modeling problem was considered by the prior art to be intractable, requiring substantial simplification, which gave poor results as compared to other techniques. Applicant, however, found that this approach could be made effective, and provided new and useful results.

DEPENDENT CLAIMS

Claims 3 and 12, provide that the model is evaluated to determine a transfer function of the segmented transmission line. While Huss apparently discloses a transmission line model which may be evaluated, this model is not typically useful for the analysis optimized segmented transmission lines, since the model is typically sufficiently inaccurate to yield useful results.

Claim 4 provides that the adjusting means allows adjustment of all characteristic values. None of the cited references discloses an optimization process, and, for example, the '326 merely defines a set of ratios.

Claims 6 and 14, provide that the precision of the algorithm or evaluation exceeds a manufacturing tolerance of the segmented transmission line. None of the cited references discusses this issue.

Claims 7 and 15, provide a means or the step of outputting a predicted performance of the segmented transmission line based on the respective characteristic values. In each respective

claim, the segments are optimized, and therefore, such respective characteristic values differ from those known in the art.

Claims 8 and 17, provide that the respective characteristic values are non-incrementally distributed across a range, while claims 9 and 18, provide that the respective characteristic values are non-monotonically distributed across a range. While the '326 patent also provides non-incremental and non-monotonic distributed values, these are not optimized and therefore differ from the present invention.

Claim 16 provides the step of producing a set of transmission line segments according to the selected optimum segment characteristics. This step requires that the optimized component by physically realizable, and correspond to the optimal component characteristics. Therefore, this is distinguished from the cited art.

Claim 19 provides that the segment characteristic comprises a respective segment length and the optimization criteria comprises a minimization of worst case VSWR over a radio frequency band. Claim 20 provides that the segmented transmission line comprises an air-spaced coaxial transmission line adapted for transmitting an RF signal; the segment characteristic comprises a respective segment length; and the optimization criteria comprises a minimization of worst case VSWR over a radio frequency band. Claim 24 provides that the performance constraint is selected from the group consisting of a signal transmission efficiency and a VSWR.

Claim 25 provides that the segmented transmission line comprises an air-spaced coaxial transmission line adapted for transmitting an RF signal, the characteristic value being a length of a respective transmission line segment, the optimized respective characteristic values being non-incrementally and non-monotonically distributed across a range. These claims therefore cite an optimization criteria, not taught or suggested in the cited references.

Claim 21 provides that the set of segment characteristics is in an optimal order. None of the cited references discuss the effect of component order, and are thus distinguished.

CONCLUSION

Applicants therefore respectfully submit that the applicant was in possession of the invention at the time of the application, the presently claimed invention is adequately supported by the specification, includes definite claims, and is not anticipated nor obvious in view of the '326 patent alone or in view of Huss, and therefore that the present Final Rejection should be reversed.

Respectfully Submitted,

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By

Date 12/23/02

APPENDIX A - CLAIMS

1. A computer model for describing a performance of a segmented transmission line having a plurality of segments, each segment having a transfer function, comprising:

(a) means for storing at least one characteristic value the transfer function of a respective segment of the segmented transmission line;

(b) means for storing information relating to at least one algorithm, said algorithm being for determining the effect of a respective characteristic value and sequence of transmission line segments on a performance of the overall segmented transmission line; and

(c) means for adjusting a characteristic value,

whereby a set of characteristic values is defined for respective transmission line segments, having an optimized performance in view of the at least one algorithm.

2. The model according to claim 1, wherein the characteristic value is a length of a respective transmission line segment.

3. The model according to claim 1, wherein the at least one algorithm calculates a transfer function of the segmented transmission line.

4. The model according to claim 1, wherein the adjusting means allows adjustment of all characteristic values, the adjustments being based on a determined performance of the segmented transmission line.

5. The model according to claim 1, wherein the segmented transmission line comprises an air-spaced coaxial transmission line adapted for transmitting an RF signal, the performance comprising signal transmission efficiency.

6. The model according to claim 1, wherein a precision of the algorithm exceeds a manufacturing tolerance of the segmented transmission line.

7. The model according to claim 1, further comprising means for outputting a predicted performance of the segmented transmission line based on the respective characteristic values.

8. The model according to claim 1, wherein the respective characteristic values are non-incrementally distributed across a range.

9. The model according to claim 1, wherein the respective characteristic values are non-monotonically distributed across a range.

10. A method for optimizing the segment characteristics of a segmented transmission line, comprising the steps of modeling the electrical performance of the segmented transmission line, evaluating the model for electrical performance, and selecting a set of segment characteristics, based on the evaluation, which meets a set of predefined optimization criteria.

11. The method according to claim 10, wherein the set of segment characteristics comprises a respective length of each segment.

12. The method according to claim 10, wherein the model is evaluated to determine a transfer function of the segmented transmission line.

13. The method according to claim 10, wherein the segmented transmission line comprises an air-spaced coaxial transmission line adapted for transmitting an RF signal, the predefined optimization criteria comprising signal transmission efficiency.

14. The method according to claim 10, wherein a precision of the evaluation exceeds a manufacturing tolerance of the segmented transmission line.

15. The method according to claim 10, further comprising outputting a predicted performance of the segmented transmission line based on the respective segment characteristics.

16. The method according to claim 10, further comprising the step of producing a set of transmission line segments according to the selected segment characteristics.

17. The method according to claim 10, wherein a variation in respective segment characteristics is distributed non-incrementally.

18. The method according to claim 10, wherein a variation in respective segment characteristics is distributed non-monotonically.

19. A segmented transmission line, produced according to claim 16, wherein the segment characteristic comprises a respective segment length and the optimization criteria comprises a minimization of worst case VSWR over a radio frequency band.

20. A segmented transmission line, produced according to claim 16, wherein the segmented transmission line comprises an air-spaced coaxial transmission line adapted for transmitting an RF signal; the segment characteristic comprises a respective segment length; and the optimization criteria comprises a minimization of worst case VSWR over a radio frequency band.

21. The method according to claim 10, wherein said set of segment characteristics is in an optimal order.

22. A computer system for describing a performance of a segmented transmission line having a plurality of segments, each segment having a transfer function, comprising:

(a) a memory location storing at least one characteristic value the transfer function of a respective segment of the segmented transmission line;

(b) a memory location storing information relating to at least one algorithm, said algorithm being for determining the effect of a respective characteristic value and sequence of transmission line segments on a performance of the overall segmented transmission line; and

(c) a processor, executing a program for iteratively adjusting a set of characteristic values for respective transmission line segments to achieve an optimized performance within a predetermined performance constraint with respect to the at least one algorithm.

23. The system according to claim 22, wherein the characteristic value is a length of a respective transmission line segment.

24. The system according to claim 22, wherein the performance constraint is selected from the group consisting of a signal transmission efficiency and a VSWR.

25. The system according to claim 22, wherein the segmented transmission line comprises an air-spaced coaxial transmission line adapted for transmitting an RF signal, the characteristic value being a length of a respective transmission line segment, the optimized respective characteristic values being non-incrementally and non-monotonically distributed across a range.

APPENDIX B

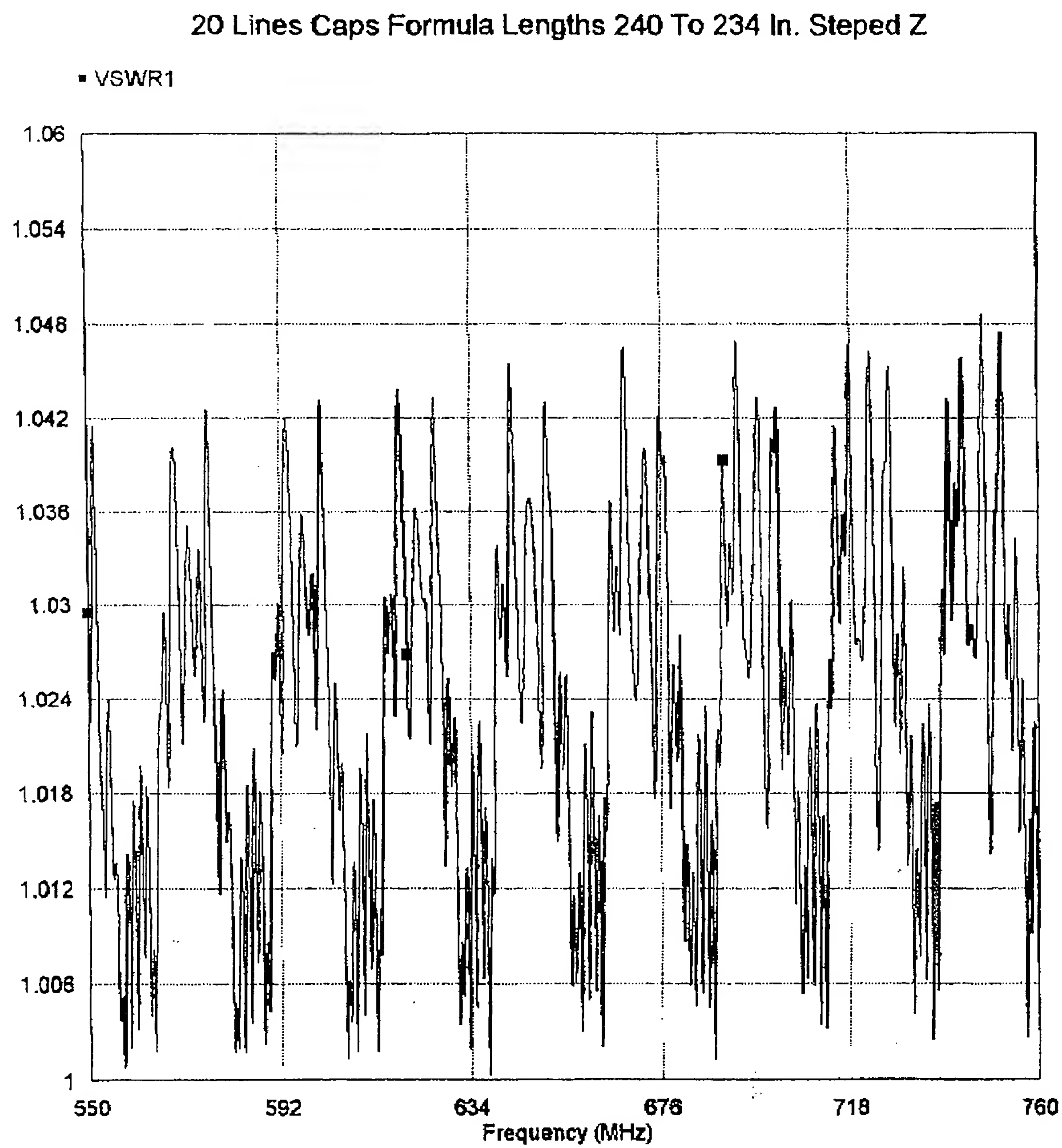

Fig. 1

APPENDIX C

Cable Dash No.	$\sqrt{5/\text{dash no.}}$ Factor	Smallest Length 5.500" Cable Length	Cable Span	Manufacturing Tolerances +	Manufacturing Tolerances -	
-3	1.2457	6.8514	2.6014	0.000	0.200	
-7	1.4758	8.1169	3.8669	0.000	0.200	
-17	1.7623	9.6927	5.4427	0.150	0.050	
-23	1.8722	10.2971	6.0471	0.050	0.150	
-29	1.9610	10.7855	6.5355	0.100	0.100	Matched #1
-37	2.0589	11.3240	7.0740	0.100	0.100	
-61	2.2754	12.5147	8.2647	0.100	0.100	
-83	2.4200	13.3100	9.0600	0.100	0.100	
-223	2.9489	16.2190	11.9690	0.125	0.075	
-293	3.1144	17.1292	12.8792	0.100	0.100	
-383	3.2858	18.0719	13.8219	0.100	0.100	Matched #2
-503	3.4699	19.0845	14.8345	0.100	0.100	

FIG. 1